

**Amendments to the Drawings**

A copy of each of Figures 1-7 discussed in the specification is enclosed with this response. Since the subject matter of the figures is fully presented in the specification, entry of the figures into the record is respectfully requested. The attached figures have been obtained from U.S. Patent Publication 2007/0014518.

#### REMARKS/ARGUMENTS

Claims 1-11 have been canceled. Claims 12-17 are active in the case. Reconsideration is respectfully requested.

The present invention relates to an optical waveguide chip that is useful as a component of an optical multiplexer/demultiplexer that is used in optical communications.

#### Claim Objection

The objection to Claim 11 is obviated by the cancellation of the claim from the case.

#### Claim Amendments

The new claims of the application are directed to a method of manufacturing an optical waveguide chip, and not to the chip itself. Support for new Claim 12 is found in the original claims and at page 19, lines 7-8; Claim 2; page 3, lines 16-21; and page 25, line 10 to page 26, line 10.

Support for new Claim 14 is found in original Claim 4 and Figs 1-7. Support for new Claim 15 is found in original Claims 4 and 5.

Support for new Claim 16 is found on page 8, line 4 of the specification. Support for new Claim 17 can be found in Figs 1-7. None of the newly presented claims are believed to have introduced new matter into the case. Entry of the new claims into the record is respectfully requested.

#### Invention

The essential aspects of the present invention as claimed is the use of a radiation-sensitive polysiloxane composition, which is susceptible to development by an alkali agent, for the core portion, the lower clad layer, the upper clad layer and the optical fiber guide

portion of an optical waveguide chip. Moreover, the alkali development step of the present method is performed during the patterning of the core portion, the lower clad layer, the upper clad layer and the optical fiber guide portion. Further, the upper clad layer and the optical fiber guide portion are formed simultaneously as they are patterned in the alkali development step.

The present invention results in the advantages that the transmission efficiency of single-mode light is high; the optical axes can be aligned with high precision, even with single-mode optical fibers; the optical waveguide chip is efficiently manufactured and the heat resistance of the product is excellent.

#### Claim Rejection, 35 USC 102

Claims 6-7 stand rejected based on 35 USC 102 as anticipated by Tessier et al, U. S. Patent 5,217,568. This ground of rejection is respectfully traversed.

Tessier et al discloses a method of forming a V-groove in an optical device in order to couple optical fibers. Note that a process feature of the reference is the application of an alkali-resistant polymer to a substrate of the device in order to cover both a selected region and the region adjacent thereto. The covering material is a multi-functional benzocyclobutane compound that is cured. While the materials of the cladding 24 and the embedded waveguide 22 in Fig 4 of the patent are formed of an alkaline resistant polymer, the polymer can not be developed by alkali treatment. This is clear from the disclosure at column 1, last paragraph, column 3, lines 35-37 and column 4, lines 33-34. Accordingly, this teaching of the reference is contrary to the present invention as claimed.

It is also pointed out that in Tessier et al, opening 61 in layer 60 is formed by treatment with a plasma formed from a gaseous mixture of oxygen and trifluoromethane, and V-groove 26 are formed by an alkali etching treatment of the BCB-coated substrate. (See col

4, lines 61-67, col 5, lines 9-11 and Figs 5-8.) Moreover, in Tessier et al a cladding and a V-groove are not formed simultaneously by a patterned alkali developing method, contrary to the requirement of the present claims. Accordingly, the anticipatory ground of rejection fails and withdrawal of the rejection is respectfully requested.

Claims 6-7 stand rejected based on 35 USC 102 as anticipated by Yotsui et al, 2001/255428. This ground of rejection is respectfully traversed.

Yotsui et al discloses an optical device that has an optical wiring layer that has an optical fiber connecting hole. The optical wiring layer has a core and a clad, an optical fiber connecting hole that is provided at the end of the core. The reference mentions a polysiloxane as an example of a material that is used as a core portion and a clad portion. However, Yotsui et al does not mention that the polysiloxane is developed by an alkali developing technique. Moreover, the reference shows that the second cladding 11 in Fig 2 is cured while an optical fiber is disposed in the second cladding 11. Accordingly, it would appear that the second cladding 11 is cured by the application of heat, and not by a chemical development. Still further, the present claims require that the upper clad is formed by being patterned by development of the same with an alkali agent, which limitation clearly distinguishes over '428. Thus, the reference is not believed to anticipate the invention as claimed and withdrawal of the rejection is respectfully requested.

Claims 6-7 stand rejected based on 35 USC 102 as anticipated by JP 8-271746. This ground of rejection is respectfully traversed.

The '746 reference discloses an optical waveguide which is useful as an optical device in the optical communications field. Example 3 of the reference is of significance to the present invention in its disclosure of the formation of core, lower clad and upper clad components from siloxane materials that contain specific linkages as shown in paragraphs

[0047] and [0048]. However, the reference does not disclose the formation of an optical wave guide portion from monomers that have specific siloxane linkages.

Applicants also note that Fig 4 of the reference discloses a method for forming a V-groove for the fixing of an optical fiber. However, the technique employed in the reference is to form a V-groove and a core using molds 32 and 37. (See paragraphs [0051] to [0055]. These features of the device are not developed by alkali treatment. Moreover, upper clad 35b and a V-groove are not simultaneously formed. Withdrawal of the rejection is respectfully requested.

#### Claim Rejection, 35 USC 103

Claims 8-9 stand rejected based on 35 USC 103 as obvious over Tessier et al, U. S. Patent 5,217,568. This ground of rejection is respectfully traversed.

The obviousness ground of rejection is traversed for the same reasons as presented above in the discussion of the anticipatory ground of rejection over the same reference. The reference discloses a method of forming a V-groove in an optical device in order to couple optical fibers. The reference describes the application of an alkali-resistant polymer to a substrate of the device in order to cover both a selected region and the region adjacent thereto. The covering material is a multi-functional benzocyclobutane compound that is cured. While the materials of the cladding 24 and the embedded waveguide 22 in Fig 4 of the patent are formed of an alkaline resistant polymer, the polymer can not be developed by alkali treatment. Accordingly, the essential features of the present invention are not suggested by the patent. Withdrawal of the rejection is respectfully requested.

Claims 10-11 stand rejected based on 35 USC 103 as obvious over Tessier et al, U. S. Patent 5,217,568 in view of Barclay et al, U. S. Patent Publication 2003/0235785. This ground of rejection is respectfully traversed.

The Barclay et al patent discloses negative acting photoresist compositions which may contain Si-resins such as polysiloxanes, which are developable by an aqueous alkaline developer and which can be used for the formation of optical waveguides. (See abstract, and paragraphs [0025],[0056] and [0083]) Barclay et al does not however disclose an optical fiber guide portion.

The Examiner combines the disclosure in Tessier of a method of forming an optical fiber guide portion with a method of employing an aqueous alkaline developer for polysiloxanes which material is used for the formation of optical waveguides in Barclay et al. However, it should first be noted that neither reference teaches nor suggests the claimed feature of the present process of simultaneously forming the upper clad layer and the optical fiber guide components by alkali development. This method leads to an efficient and simple manufacture of an optical waveguide chip without having to employ a plasma or alkali etching which is necessary to form an opening 61 and a V-groove 25 in Tessier et al. In this regard it should be noted that the alkali etching disclosed in Tessier et al is quite different from the alkali development in the present invention in that for alkali development as practiced in the present invention it is not necessary to use a cover material as employed in Tessier et al. It is necessary, however, to prepare two different types of substances, one of which is a substance that has an alkali solubility and a substance that has an alkali resistance. In the alkali etching practiced by Tessier et al, it is necessary to employ a cover, i.e., a cladding 24 that is alkali resistant (Fig 8 of Tessier et al). On the other hand, for etching, only one substance is necessary.

It should also be noted that Barclay et al discloses that resins are to be used that contain acrylate units (see [0047]). However, when a (meth)acrylate radiation sensitive resin is employed together with an alkaline aqueous solution, a problem of decreased optical transmission efficiency occurs (see page 3, line 16 to page 4, line 2). Applicants submit that

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the preference for the use of resins that contains acrylate units mitigates against the technique of the present invention. In fact, the three advantageous effects noted in the discussion of the present invention above can not be achieved by the techniques disclosed in Barclay et al. Accordingly, withdrawal of the rejection is respectfully requested.

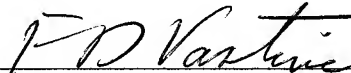
It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

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